

# Description

## Stones-like laminates

### BACKGROUND OF INVENTION

[0001] The present invention relates to sheets and slabs of acrylic solid surface now commonly used as kitchen countertops, interior and exterior decorative coverings and architectural panel. Since the early 1980's, several major manufacturers have developed their own brand of solid surface products. For the most part, these products are expensive because acrylic panel need a lot of polymer. The present invention can create the appearance of granite, marble or other types of stone surfaces. The present invention show superior hardness, high structural toughness at a low cost when compared to other acrylic solid surfaces or other stone-like laminates products.

[0002] Other processes have attempted to reduced the cost of acrylic panel. Several such prior art teachings are shown in U.S. Pat. No. 3,963,846 proposes a backing sheet consisting of a multicellular resin-impregnated paper core. This layer is made partially of polymer and the cost of this

products is for the same toughness, superior of the present invention

[0003] U.S. Pat. No. 4,446,177 disclosed simulated stone product formed of a reinforced plastic including a gelcoat layer, a thermoplastic or thermoset resin matrix and a backup layer. The backup layer is comprised of a fibrous polyester sheet impregnated with thermoplastic or thermoset resin and plasticizer. This layer is made partially of polymer and show similar problems as U.S. Pat. No. 3,963,846.

#### **SUMMARY OF INVENTION**

[0004] The object of the present invention is to provide a composite lamina which is relatively inexpensive to manufacture and provide a simulated natural stone-like appearance.

[0005] The main advantage of the present invention is the backer layer, more specifically a cement board panel who gives over other solutions offered today a very good adhesion for the organic portion, better strength for the same thickness, and a very economical way to make stone-like panels. For example, at an equal strength, it is more economical to put a cement board backing with a thinner layer of polymer than no backing and a greater amount of polymers.

[0006] By utilizing the process of the present invention, various solid surface decorative articles can be provided having a myriad of aesthetic designs. Moreover such process is economical and capable of mass production. Also, highly detailed inlays may be produced from engraved cement board backing with one or more color as inlays. Final product may have embossed surface made by the embossed and/or engraved cement board.

#### **DETAILED DESCRIPTION**

[0007] The present invention proposes a cement board as a backup layer. Hard surface of cement board provide a very good substrate for engraved and/or embossed high precision pattern. Cement board are corrosion resistant and maintenance cost is minimal. Cement board provides high rigidity and stiffness at low cost.

[0008] The present invention is impact resistant, termite and vermin resistant highly fire-resistant, moisture resistant and it provides to the final product very good and economical structural qualities and it is perfect for interior/exterior application such as wall panels, balconies and decks.

[0009] The present invention decrease the needs of polymer material without affecting the strength of the product, therefore the present invention gives a low cost versus strength

ratio.

[0010] The present invention provides a high strength-to-weight ratio which enables the resin layer to be thinner without sacrificing mechanical strength characteristics.

[0011] The present invention is easily cut and installed using standard carpentry tools. The back layer is composed of a flat or engraved cement board painted or not. Such cement board is marketed under brand names such as, but not limited to Sheetrock, Durock, HardiBacker, PermaBase, PRO\_Backerboard, ProRoc, WonderBoard, Plycem and RhinoBoard. The engraved cement board layer improved the adhesion surface with the resin. The transparency of the resin or other transparent material used for the inorganic portion creates a depth effect that simulates the granite or marble appearance. Engraved a cement board causes no problem and can be done by various type of machines. The painted part of the process can be realized on the entire surface or partially with one or many colors. The cement board may be painted with various art techniques. Cement board can be impregnated with acrylic and/or any dyes that may be desirable for color control. Cement board backing show that unsaturated polyester resin can't change dimensional stability and rigidity of this layer.

[0012] The present invention have the advantage of a molded composition marketed under brand names such as Corian , Hi-Macs , Staron and Earthstone but with lightness, strength and low cost. Like other molded products, the present invention has the advantage of being easily removable of the mold, without using detaching substances.

[0013] Particle board or fiber board, at an equal thickness, are not strength enough and do not have water proof quality of cement board. Particle board or fiber board need to be treating at there four face to be waterproof and that kind of operation increase the cost of the final product. Particle board or fiber board also have adhesion problems with some polymers.

[0014] Plywood, at an equal thickness, will deteriorate under long-term exposure to humidity. The thin parts of polymers of the present invention provide a low cost advantage. The thin polymers layer of the present invention has little tensile strength and need rigid and stiff substrate. Cement board are harder than plywood. The plywood substrate also have adhesion problems with some polymers.

[0015] Metal or polymeric materials as a back layer are definitely more expensive than cement board substrate.

[0016] One problem with actual cast acrylic sheet is that they are extremely heavy and thus difficult to fabricate and transport. Further, large quantities of resin required to make such a structure substantially increase the price. The advantage of the present invention is the high strength-to-weight ratio and strength-to-thick ratio, cost effective, easy to handle and install. The ideal thickness for the present invention is  $3/8$  (10 mm);  $1/4$  (6 mm) engraved cement board with a  $5/32$  (4 mm) polymer/inorganic portion. The strength-to-weight ratio and strength-to-thick ratio of molded products such as Corian are not as good as the present invention. The  $3/4$ " (19 mm) thickness sheet can only reach 12"(304 mm) open spacing.

[0017] Thickness and/or expensive price of actual products bring a major disadvantage of the kitchen design; the back-splash of the countertops must be made with other material such as ceramic. Finding ceramic who will fit with the countertops colors may be a difficult task. With the thickness of the present invention, less than  $3/8$  (10 mm) and the affordable price of the product, Kitchen design will be easier and esthetical.pleasing.

[0018] While a wide variety of substantially clear or transparent thermosetting resins such as acrylic resins, vinyl ester

resins, epoxy resins and other resins which are resistant to hot water are available as gelcoats. For the present composition, unsaturated polyester resins are preferred for reasons of cost, availability, clarity and ease of handling. Depending on the choice of raw materials and on how the resin is manufactured, polyesters can be formulated to meet any one of a wide range of special needs.

[0019] The polyester resin gelcoat may contain other promoters, anti-oxidants and the like. Preferably a flexible agent is added such as an alkyd resin dissolved in styrene and other vinyl monomers. Such agents are marketed under brand names such as PolyLite Polyester Flex Resin by Reichold Chemicals, White Plains, N.Y. Other flexibilizing agents are suitable and may be used. The purpose of the gelcoat is to provide a clear stain resistant film on the surface of the laminate. Many types of gelcoats are available under such brand names as Ferro NPG Gelcoat VT-12044, manufactured by the Ferro Corporation, Cleveland, Ohio.

[0020] A wide variety of generally clear, transparent or translucent thermosetting polyester resins are available and are within the scope of the present invention. In the preferred embodiment such resins are formed by the copolymeriza-

tion of styrene and unsaturated polyester formed by reacting an alpha, beta-unsaturated dicarboxylic acid with glycol... Other unsaturated polyester resins within the scope of the present invention are those discussed in the Modern Plastics Encyclopedia as being the polycondensation product of a dicarboxylic acid with a dihydric alcohol. Examples of diacids include phthalic acid and isophthalic acid. Examples of the dihydric alcohol include ethylene glycol and propylene glycol. These types of unsaturated polyester resins are usually catalyzed with peroxide.

[0021] The laminate composition of the present invention optionally includes at least one filler. The laminate structures ideally have transparent and opaque filler, so that the product corresponds to the natural rock material with respect to its reflective properties and its impression of color and depth.

[0022] The filler included transparent and/or opaque portion such as calcite, feldspar, glass, marble, mica, obsidian, quartz, sand, silica, wollastonite and various filled or unfilled pigmented or dyed, insoluble chips of polymeric materials such as cellulose, polyethylene, ethylene copolymers, cross linked polyacrylic polymers, polyesters, polypropylenes, cross linked polyvinyl chlorides and poly-



acetals can be add to increase the esthetical aspect of the panel. Since room temperature curing is too time-consuming it is generally preferred to employ elevated temperatures and catalysts which allow for faster curing of the polyester layer. Mold temperatures up to 100.degree. F. can be employed with cement board backing. Additionally catalysts may be added to the unsaturated polyester matrix to accelerate the curing.

[0023] In terms of the fillers which are used, the filler is preferably finely divided and can be any one of the well recognized fillers used in the prior art including calcium carbonates, silica, glass frit, alumina trihydrate, glass flour, antimony oxide, quartz flour, onyx flour, talc, titanium dioxide and the like.

[0024] The veins in marble may have a wide range of color. These veins in marble slabs are preferably painted on the cement board layer but can be add to the resin from colorants of varying viscosity. Such colorants are commercially available. Coloring matter which is insoluble or slightly soluble in the polymerizable mixture is used to produce veining. The terms "pigment" as applied herein is used in the broad sense to include inorganic pigments which may be opaque, translucent and transparent and

may be natural or synthetic. The term "dye" includes lakes, toners and organic and inorganic pigments.

[0025] According to the invention a composite surface element comprises visible side and a rear side that find utility in home and office construction in such applications as countertops, shower pan and wall panels, balconies and decks, office tables and furniture. The sheets or slab includes an engraved and painted fiber cement board, who give the impressions of colors and depths, an acrylic resin and inorganic fragments. Reinforcing material may be included on the cement board The cement board layer is commercially available in sheet form of various thicknesses. The cement board surface can be partially or totally painted with one or more colors with one or many steps. Stencil-like technique with the engraved portion can be utilized with latex and/or dye of one or many colors for a specific drawing. The acrylic resin is commercially available. The acrylic resin, preferably unsaturated polyesters are poured on the cement board surface. Acrylic resin may contain transparent or translucent particles and/or opaque particles.

[0026] Since room temperature curing is too time-consuming it is generally preferred to employ elevated temperatures

and catalysts which allow for faster curing of the polyester layer. Mold temperatures up to 100.degree. F. can be employed with cement board backing. Additionally catalysts may be added to the unsaturated polyester matrix to accelerate the curing. Such catalysts are well-recognized and usually free radical catalysts based on a peroxide-type compound such as for example benzoyl peroxide, methyl ethyl ketone peroxide, tertiary butyl perbenzoate and cumene hydroperoxide are usually added to the polyester resin to effect curing. A number of other peroxide catalysts such as cyclohexanone peroxide, 2, 4-dichlorobenzoyl peroxide, bis-(para-bromobenzoyl) peroxide, and acetyl peroxide, and the like. Typically, the catalyst may be present in amounts ranging from about 0.1 to 6% by weight of the polyester resin.

[0027] Sanding and polishing can be made at different step of the method. Different Polymer commercially available can be utilized as a finish coating for the desirable gloss.